

Project: Law of Sines and Law of Cosines Applications

Name _____ Period _____ Due Date _____ Score _____

1. Locating Lost Treasure

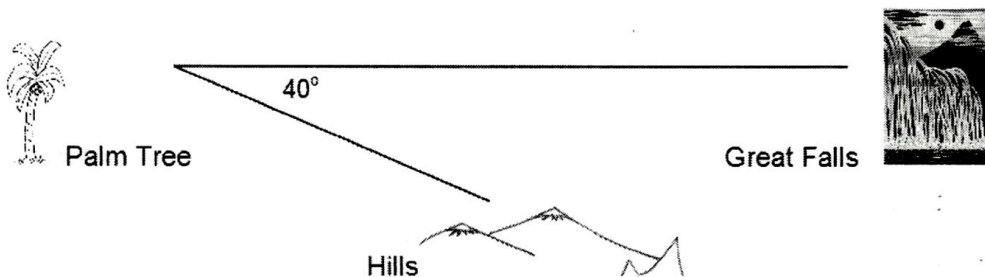
While scuba diving in the Mysterious Triangle in the Caribbean, a group of five trigonometry students discovered a treasure map in a small watertight cask on a pirate schooner that had sunk in 1747. The map directed them to a small desert island in the area.

- The directions on the map read as follows: From the tallest palm tree, sight the Great Falls. (This is your line of sight.)
- Turn 40° clockwise from your line of sight and walk 70 paces to the hills.
- From the hills, walk 50 paces back to the sight line between the palm tree and the Falls.
- Dig there.

(Pirates don't give good compass directions – do they?)

Upon reaching the island, the five students found the hills, the Falls and the tallest palm tree; but the island had been used as a munitions dump during World War II and the area around the hills was impassible due to hidden land mines. Luckily, the students realized they could use their knowledge of trigonometry to determine a direct path to the treasure. They first decided that a "pace" must be a yard. They worked for a while and came up with the following plan:

From the palm tree, they sighted the hills. They turned 40° counterclockwise then walked about 75.4 yards toward the Falls. The treasure should be buried there.

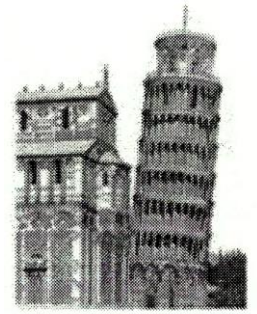


- a. Verify that this is a solution to the problem. Show your work.

b. This location did not yield any treasure! Explain why this could happen. (Use complete sentences in your explanation.)

c. Find the other possible location of the hidden treasure. How far is the treasure from the palm tree? Show your work. (Draw the triangle and show all steps leading to the treasure's location.)

2. The Leaning Tower of Pisa was constructed between 1173 and 1350 A.D. It began to lean almost immediately and by 1178, its lean was noticeable. In 1934, cement was injected into the base of the structure to halt the leaning progression, but instead it actually accelerated the lean. By 1990, there were fears that the tower would collapse due to the accelerating rate of lean.



On Jan. 7, 1990, the tower was closed to the public. Steel cables were attached to the tower, and over the next ten years, the tower was gradually pulled back toward the vertical. The tower was again reopened to the public on December 15, 2001. Although the tower still leans, it is no longer in danger of collapse.

a. At a distance of 500 feet from the base of the Leaning Tower of Pisa and in the direction that it is leaning, the angle of elevation to the top of the tower is 20.24° . If the tower leans at an angle of 5.45° from the vertical, what is the length of the tower? Draw a diagram and solve the problem. Show all work and round your answer to the nearest hundredth.

b. What is the angle of elevation of the tower if you measure from a point 500 feet in the opposite direction from which it is leaning? Draw a diagram and solve the problem. (You will need to use the information and answer you found from part a.)